



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/046,797	01/14/2002	Huitao Luo	10014091-1	6419

7590 12/27/2004  
HEWLETT-PACKARD COMPANY  
Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, CO 80527-2400

EXAMINER

RICHER, AARON M

ART UNIT	PAPER NUMBER
----------	--------------

2676

DATE MAILED: 12/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/046,797

Applicant(s)

LUO, HUITAO

Examiner

Aaron M Richer

Art Unit

2676

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed November 1, 2004 have been fully considered but they are not persuasive.
2. Applicant's arguments with respect to claims 1, 12, and 33 have been considered but are moot in view of the new ground(s) of rejection.
3. As to claim 20, the applicant argues that there is no motivation to combine the teachings of Catros (U.S. Patent 4,843,630) and Makram-Ebeid (U.S. Patent 6,332,034). The applicant further argues that the previous statement by the examiner that contours and regions are closely related was unsupported. The examiner disagrees, as Makram-Ebeid was cited as using "edges" to define regions. An object's "edges" are commonly referred to as "contours", even in the applicant's own disclosure (see paragraph 0035). To further support the statement relating contours and regions, the examiner cites Suzuki (U.S. Patent 5,974,175). Suzuki cites prior art which "...separate[s] the object-contour from the background region..." (col. 2, lines 8-15). This prior art is consistent with the examiner's previous assertion that contours are used to separate regions.
4. The applicant further argues that Catros does not disclose merging regions as alleged in the previous action. The examiner recognizes that the contours of Catros do not specifically define regions, and did not mean to imply that in the previous action. What was meant was that Catros is directed to contours, and contours often define regions as described above in the teachings of Makram-Ebeid and Suzuki. The

examiner disagrees with the applicant's assessment that one of skill in the art concerned with bridging disjointed ends of a contour would not look to merge regions. Contours, in general, often define regions and thus one skilled in the art would look to references that process regions to improve an invention that connected contours.

***Claim Rejections - 35 USC § 103***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 2, 10, 12, 16, 18, 25-27, 29, and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (U.S. Patent 5,774,595) in view of Suzuki (U.S. Patent 5,974,175)

7. As to claims 1 and 33, claim 1 recites "A system for processing boundary information of a graphical object, comprising: code for receiving a graphical image that comprises said graphical object wherein said graphical object is defined by at least said boundary information". Kim discloses "The contour image data representing the contour of an object is fed to a polygonal approximation block 100, a first and a second error detection blocks 120 and 150 and a curvature calculation block 160" (col. 3, lines 1-9). Figure 1 of Kim shows that contour, or boundary, image data of a graphical object is the input to the system.

Claim 1 further recites "code for detecting a plurality of contours between respective pairs of points of said graphical image". Kim discloses the step of "fitting the contour image with a plurality of line segments to provide a polygonal approximation of

the contour image, each of the line segments joining two neighboring vertices” (col. 2, lines 7-10). This part of Kim’s invention is also shown as element 100 of Figure 1.

Claim 1 further recites “code for determining a plurality of vertices from said boundary information, wherein respective contours, which are between adjacent vertices of said plurality of vertices detected by said code for detecting, approximate respective edges of said boundary information within a distortion criterion”. Kim discloses “determining a number of vertices on the contour image” (col. 2, lines 6-7). Kim further discloses “calculating a second error which is the number of mismatched pixels between the reconstructed contour segment and its corresponding contour segment [and] comparing the second error with a predetermined threshold value” (col. 2, lines 27-31). Kim also discloses “if the second error is equal to or larger than the threshold value... repeating the steps...for all the line segments formed by the vertices determined” (col. 2, lines 31-42). This threshold value reads on the “distortion criterion” of Claim 1, and the method described by Kim assures that the contours detected will be within this error threshold.

Kim does not disclose individual contours being detected responsive to respective user input of a user. Suzuki, however, discloses a motion picture apparatus, in which a user picks points adjacent boundary locations so a contour can be detected (col. 2, lines 53-67; col. 3, lines 1-21). The motivation for this is so that a user can specify a portion of the image to separate (col. 1, lines 10-24). It would have been obvious to one skilled in the art to modify Kim to be responsive to user input in order to specify a portion of an image to separate as taught by Suzuki.

8. Claim 2 recites "The system of claim 1 further comprising: code for creating an approximated boundary utilizing at least said graphical image, said plurality of vertices, and said code for detecting". Kim discloses "fitting the contour image with a plurality of line segments to provide a polygonal approximation of the contour image" (col. 2, lines 7-10).

9. Claim 10 recites "The system of claim 1 wherein said code for determining a plurality of vertices only analyzes vertices from a searchable set of vertices". Kim discloses "determining a number of vertices on the contour image" (col. 2, lines 6-7). This disclosure reads on a "searchable set of vertices" because any vertex could be a part of a "searchable set of vertices". This argument also reads on claim 18, which claims the method implemented by the system in claim 10.

10. Claim 12 recites "A method for processing boundary information of a graphical object, comprising: receiving a graphical image that comprises said graphical object, wherein said graphical object is defined by at least said boundary information". Kim discloses "The contour image data representing the contour of an object is fed to a polygonal approximation block 100, a first and a second error detection blocks 120 and 150 and a curvature calculation block 160" (col. 3, lines 1-9). Figure 1 of Kim shows that contour, or boundary, image data of a graphical object is the input to the system.

Claim 12 further recites "determining a plurality of vertices from said boundary information, wherein adjacent vertices of said plurality of vertices are associated with respective contours that approximate respective edges of said boundary information within a distortion criterion, wherein said respective contours are detected by analysis of

said graphical image by a predetermined function". Kim discloses "determining a number of vertices on the contour image" (col. 2, lines 6-7). Kim further discloses "calculating a second error which is the number of mismatched pixels between the reconstructed contour segment and its corresponding contour segment [and] comparing the second error with a predetermined threshold value" (col. 2, lines 27-31). Kim also discloses "if the second error is equal to or larger than the threshold value... repeating the steps...for all the line segments formed by the vertices determined" (col. 2, lines 31-42). The threshold value disclosed by Kim reads on the "distortion criterion" of Claim 1, and the method disclosed by Kim assures that the contours detected will be within this error threshold. Kim further discloses "fitting the contour image with a plurality of line segments to provide a polygonal approximation of the contour image, each of the line segments joining two neighboring vertices" (col. 2, lines 6-10). This disclosure reads on a predetermined function to detect contours.

Claim 12 further recites "encoding at least said plurality of vertices in a data structure to represent said boundary information". Kim discloses "providing the position of the two vertices of a line segment as segment data" (col. 2, lines 10-11) and "coding the set of quantized transform coefficients and the segment data of the contour segment" (col. 2, lines 25-33).

Claim 12 further recites "converting graphical information of the data structure from a first format to a second format different from the first format". Kim discloses receiving input of a contour image and transforming that image into a set of quantized transform coefficients and segment data, possibly in a JPEG format (col. 2, lines 3-42;

col. 5, lines 34-42). In addition, official notice has been taken of the fact that format changes in images and videos are very well-known in the art (see MPEP 2144.03). These format changes are necessary to ensure compatibility with all systems. For instance, high definition broadcasts are converted to standard definition broadcasts, AVI files are converted to MPEG files, JPEG to BMP, etc. It would have been obvious to one skilled in the art to modify Kim to convert from one format to another in order to ensure compatibility.

Kim does not disclose individual contours being detected responsive to user input. Suzuki, however, discloses a motion picture apparatus, in which a user picks points adjacent boundary locations so a contour can be detected (col. 2, lines 53-67; col. 3, lines 1-21). The motivation for this is so that a user can specify a portion of the image to separate (col. 1, lines 10-24). It would have been obvious to one skilled in the art to modify Kim to be responsive to user input in order to specify a portion of an image to separate as taught by Suzuki.

11. Claim 16 recites "The method of claim 12 wherein said determining comprises identifying a point of said boundary information that is associated with a greatest amount of curvature". Kim discloses "The extra vertex selection block 170 compares the curvatures for the target pixels from the curvature calculation block 160 to select therefrom a target pixel, e.g., F shown in FIG. 4A, having the largest curvature" (col. 5, lines 17-22).

12. As to claims 25, 29 and 34, Kim in view of Suzuki discloses the system of claim 1. Suzuki does not expressly disclose a system where user input is different for



individual ones of the contours. However, since Suzuki takes user input each time a contour is detected, it is inherent to the invention that a different contour would require a different input.

13. As to claim 26, Kim in view of Suzuki discloses the system of claim 25. Suzuki further discloses a system where user input selects an area of the graphical image wherein searching for contours is performed (col. 7, lines 28-37; the user selects points near a boundary, thus defining an area).

14. As to claim 27, Kim in view of Suzuki discloses the system of claim 26. Suzuki further discloses a system wherein the graphical image has an associated area and the selected area comprises an area less than an entirety of the area of the graphical image (fig. 5a, the car does not comprise the entirety of the graphical image).

15. As to claim 35, Kim in view of Suzuki discloses the system of claim 12. Suzuki further discloses extracting the graphical information defined by the boundary information from the graphical image (col. 7, lines 48-64).

16. As to claim 36, Suzuki discloses a method wherein the extracting comprises extracting a subset of the graphical information of the graphical image comprising less than an entirety of the graphical information of the graphical image (col. 7, lines 48-64; also see fig. 5a).

17. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (U.S. Patent 5,774,595) in view of Suzuki (U.S. Patent 5,974,175) and further in view of Ikezawa (U.S. Patent 5,471,535).

18. As to claim 28, Kim in view of Suzuki discloses the system of claim 26. Neither reference discloses a system wherein the user input selects, for individual ones of the contours at least one of the respective vertices and a width of the area. Ikezawa, however, discloses a system wherein the user input selects, for individual ones of the contours at least one of the respective vertices (col. 3, lines 56-67; picking and fixing an edge position reads on picking a vertex) and a width of the area (col. 11, lines 60-67; col. 12, lines 1-5; the "range" of the area includes height and width). The motivation for this is to give the user a choice of how to detect the contour of an object if the object is complicated in shape (col. 11, lines 60-67; col. 12, lines 1-5). It would have been obvious to one skilled in the art to modify Kim in view of Suzuki to allow a user to specify vertices of a contour and width of a contour area in order to account for complicated contours as taught by Ikezawa.

19. Claims 3-5, 7-9, 13-14, 17, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Suzuki and further in view of Catros (U.S. Patent 4,843,630).

20. Claim 3 recites "The system of claim 1 wherein the code for detecting comprises a predetermined function is operable to calculate gradients associated with said graphical image". Kim in view of Suzuki discloses the system of claim 1. Neither Kim nor Suzuki discloses a predetermined function operable to calculate gradients. Catros, however, discloses a method that "uses as starting data that data representing the grey levels of the image of the amplitudes and/or orientations of the gradients which are already calculated for elaborating the image of the contours" (col. 2, lines 42-50).

Catros further discloses that an advantage to using gradients is that "This data better represents the contours than the initial luminance data" (col. 2, lines 42-50). Catros is using calculated gradient values, which implies that the calculation of gradient values is inherent to the proper function of this method. It would have been obvious to one skilled in the art to modify Kim in view of Suzuki to use gradient values for contour detection in order to better represent contours as taught by Catros.

21. Claim 4 recites "The system of claim 3 wherein said code for detecting is operable to determine a shortest path between said pair of points, wherein said shortest path is weighted by said calculated gradients". It was established in the rejection of Claim 3 above that Catros' method uses amplitudes of gradients to find contours. In addition, Catros discloses "The present invention also uses a search algorithm known under the name of Moore-Dijkstra algorithm which seems better adapted for providing a solution to one of the specific problems raised by the invention, this method consisting of searching for the existence of a contour passing through two points A and B, bringing this problem down to that already solved by this algorithm and for finding the shortest path in a graph between two tops" (col. 2, lines 50-59). In this method, Catros is using the amplitudes of gradients as weights, and reducing the contour detection problem to a "shortest path" problem. This argument also reads on claim 13, which claims the method implemented by the system in claim 4.

22. Claim 5 recites "The system of claim 4 wherein said code for detecting limits its determination of the shortest path to a rectangular area defined in part by a width parameter". Catros discloses "The search space in the image memory is defined in the

way shown in FIG. 1, where there is inserted between two points A and B, marking the ends of a discontinuity in a contour C of the image, a square of side D equal to the distance separating the two points A and B and oriented in the plane so that points A and B are disposed on two opposite sides of the square in the middle thereof" (col. 2, lines 63-68; col. 3, lines 1-2). Also see Figure 1 of Catros for further disclosure of this square. The "width parameter" in this disclosure is set to the length of side D. This argument also reads on claim 14, which claims the method implemented by the system in claim 5.

23. Claim 7 recites "The system of claim 1 wherein said code for detecting implements a Rubberband function in executable instructions". A "Rubberband function" is defined in page 6, lines 14-22 of the specification as "[a] function [that] utilizes two vertices, the supplied parameters and the underlying graphical image to detect a contour,  $B' = (b'.sub.0, b'.sub.1, b'.sub.2, b'.sub.3, \dots b'.sub.n)$ , where  $b'.sub.i$  is the  $i.sup.th$  pixel of the detected contour and  $b'.sub.0 = v.sub.1$  and  $b'.sub.n = v.sub.2$ . The contour ( $B'$ ) is detected by computing the shortest path between vertices ( $v.sub.1$  and  $v.sub.2$ ) based upon weights generated by the gradient of the underlying graphical image. This argument also reads on claim 30, which claims the method implemented by the system in claim 7.

"Moreover, the Rubberband function models the image as a graph in which each pixel is a vertex and each vertex has only 8 edges linking to its 8 neighboring pixels (as is depicted by vertex 501 in FIG. 5)..."

Catros discloses "The method consists of the steps of defining a search window between each of the facing ends of the disjointed contour elements, considering in the window the different image points as nodes on a graph, determining the elementary cost associated with each path connecting each node to its adjacent nodes from amplitude and orientation information of the luminance function used for detecting the contours, and determining the optimum path by following, from the costs obtained, a line for which the luminance gradient of the detected points appears to be a maximum" (col. 1, lines 40-54).

Catros further discloses "each node  $P_{sub.i}$  inside the search window  $F$  is connected to each of its eight neighbors  $P_{sub.j}$  by an arc  $(i,j)$  to which is assigned a cost  $M_{sub.i} = C_{sub.ij}$  corresponding to the cost associated with the passage from a point  $P_{sub.i}$  to an adjacent point  $P_{sub.j}$ . Thus, by defining the characteristic costs for each arc subtended between two adjacent nodes, an overall cost may be calculated for determining the shortest path for going from point  $A$  to point  $B$ " (col. 3, lines 2-15).

The "amplitudes" of gradients in the method disclosed by Catros are used in the same way that the "weighted gradients" are used in the "Rubberband function" of claim 7 and so the method of Catros reads on the "Rubberband function of claim 7.

24. Claim 8 recites "The system of claim 1 wherein said code for determining only analyzes points of said boundary information that are associated with respective edges that are less than a heuristic value". Catros discloses "if the coding cost of the shortest path is less than a given threshold, this path is considered as the corresponding to the desired bridging, if not, there is no bridging possible between the two points" (col. 2,

lines 59-63). The method disclosed by Catros would eliminate edges larger than a threshold, which reads on the heuristic value of claim 8. This argument also reads on claim 17, which claims the method implemented by the system in claim 8.

25. Claim 9 recites "The system of claim 1 wherein said code for determining only analyzes vertex pairs associated with edges of an edge set that is a weighted acyclic graph". Catros discloses "The method consists of the steps of defining a search window between each of the facing ends of the disjointed contour elements, considering in the window the different image points as nodes on a graph, determining the elementary cost associated with each path connecting each node to its adjacent nodes from amplitude and orientation information of the luminance function used for detecting the contours, and determining the optimum path by following, from the costs obtained, a line for which the luminance gradient of the detected points appears to be a maximum" (col. 1, lines 40-54). This meets the definition of a "weighted acyclic graph" because it uses weighted paths, in this case weighted by gradient amplitude, to determine the shortest path between two nodes.

26. Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Suzuki and Catros and further in view of Makram-Ebeid (U.S. Patent 6,332,034).

27. Claim 6 recites "The system of claim 3 wherein said calculated gradients are calculated over respective spatial areas of said graphical image limited by a scale parameter". Kim in view of Suzuki and Catros obviates the system of claim 3. Catros

discloses a method of calculating gradients, as described in the rejection to claim 3. Neither Kim nor Catros nor Suzuki discloses gradients limited by a scale parameter.

Makram-Ebeid, however, discloses "The merging of two adjacent regions is possible only in the case in which the Energy function is minimized. This Energy function comprises two terms: a first term which takes into account the intensity variance in each region of the image and a second term which takes into account the total length of the boundaries in the image, weighted by a so-called scale parameter  $\lambda$ . The execution of the algorithm consists first of all in assigning the value 1 to the scale factor  $\lambda$  and in merging two adjacent regions, if any, which minimize the Energy function. The resultant regions are then re-organized by elimination of the interface of the two merged regions, the terms of the Energy function are calculated again and a new attempt for a merger is made, utilizing the scale factor  $\lambda=1$ . This operation is repeated until there is no longer any region having an adjacent region for a merger when the scale factor  $\lambda=1$ . After each merger the resultant regions are re-organized by elimination of the interfaces. Subsequently, the same operations are performed with the scale parameter  $\lambda=2$ , etc., until the Energy function cannot be further minimized" (col. 1, lines 45-66).

Here, Makram-Ebeid is disclosing a method of merging regions, in which each region and contour is created at a certain scale parameter. The scale parameter limits the size of the area that can be merged into one region or made into one contour. The motivation for using this method is that it "eliminates the largest possible number of interfaces to merge adjacent regions whose intensities are practically identical" (col. 1,

lines 37-45). It would have been obvious to one skilled in the art to modify Kim in view of Ikezawa and Catros to include a scale parameter to merge similar adjacent regions to aid in correctly identifying contours. This argument also reads on claim 15, which claims the method implemented by the system in claim 6.

28. Claims 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (U.S. Patent 5,774,595) in view of Suzuki and further in view of Kim (U.S. Patent 6,055,337). In the following rejection, Kim (U.S. Patent 5,774,995) shall be referred to as Kim ('595) and Kim (U.S. Patent 6,055,337) shall be referred to as Kim ('337).

29. Claim 11 recites "The system of claim 10 wherein said searchable set of vertices only includes: (a) vertices associated with curvature greater than a first heuristic value and (b) vertices recursively grown by maximizing distances between adjacent vertices subject to the following constraints: (i) said maximizing distances are less than a second heuristic value and (ii) each contours between adjacent vertices detected by said code for detecting approximate respective edges of said boundary information within a distortion criterion".

Kim ('595) discloses "If the distance  $D_{sub,max}$  between the line segment AB and the farthest point, e.g., C, is greater than a predetermined threshold value, the point C becomes a vertex. This procedure is repeated, as shown in FIG. 2C, until  $D_{sub,max}$  for each segment becomes smaller than the predetermined threshold value TH1." (col. 3, lines 13-24). This method holds maximizing distances to below a threshold, which reads on the "heuristic value" of claim 11.



Kim ('595) further discloses "calculating a second error which is the number of mismatched pixels between the reconstructed contour segment and its corresponding contour segment [and] comparing the second error with a predetermined threshold value" (col. 2, lines 27-31). Kim ('595) also discloses "if the second error is equal to or larger than the threshold value... repeating the steps... for all the line segments formed by the vertices determined" (col. 2, lines 31-42). This threshold value reads on the "distortion criterion" of Claim 11, and the method described by Kim ('595) assures that the contours detected will be within this error threshold.

Neither Kim ('595) nor Suzuki discloses selecting vertices with curvature greater than a heuristic value. Kim ('337), however, discloses "Once the curvatures at the contour pixels are determined for the contour segment, the secondary vertex detection block 120 selects all contour pixels on the contour segment having curvatures larger than a predetermined threshold value  $C_{sub.M}$ " (col. 4, lines 40-56). The threshold disclosed by Kim ('337) reads on the "heuristic value" of claim 11.

Kim ('337) discloses that "it is inevitable to compress or reduce the volume of data through the use of various data compression techniques". This discloses a motivation for reducing the number of vertices to be encoded. It would have been obvious to one skilled in the art to modify Kim ('595) in view of Suzuki to use a curvature threshold to select vertices in order to reduce the number of vertices to encode as taught by Kim ('337). This argument also reads on claim 19, which claims the method implemented by the system in claim 11.

30. Claims 20-23 and 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Catros in view of Makram-Ebeid (U.S. Patent 6,332,034).

31. Claim 20 recites "A method for processing boundary information associated with an object in a graphical image, said method comprising: identifying two vertices in said graphical image". Catros discloses "a method of bridging between disjointed contour elements in an image by searching for an optimum bridging path between the facing ends of the disjointed contour elements" (col. 1, lines 40-54). These points on disjointed contour elements read on vertices, because they are points on contours to be joined by "bridging".

Claim 20 further recites "detecting a plurality of contours between said two vertices by determining a respective shortest path between said two vertices, said respective shortest path being weighted by gradient calculations of said graphical image over regions defined at least by a scale parameter, and each contour of said plurality of contours being associated with a respective scale parameter of a plurality of scale parameters". Catros discloses a method of determining a shortest path between vertices by gradient weighting, as described in the rejections to claims 3 and 4. Catros does not disclose regions defined by a scale parameter, nor does Catros disclose contours being associated with a scale parameter.

Makram-Ebeid, however, discloses "The merging of two adjacent regions is possible only in the case in which the Energy function is minimized. This Energy function comprises two terms: a first term which takes into account the intensity variance in each region of the image and a second term which takes into account the

total length of the boundaries in the image, weighted by a so-called scale parameter  $\lambda$ . The execution of the algorithm consists first of all in assigning the value 1 to the scale factor  $\lambda$  and in merging two adjacent regions, if any, which minimize the Energy function. The resultant regions are then re-organized by elimination of the interface of the two merged regions, the terms of the Energy function are calculated again and a new attempt for a merger is made, utilizing the scale factor  $\lambda=1$ . This operation is repeated until there is no longer any region having an adjacent region for a merger when the scale factor  $\lambda=1$ . After each merger the resultant regions are re-organized by elimination of the interfaces. Subsequently, the same operations are performed with the scale parameter  $\lambda=2$ , etc., until the Energy function cannot be further minimized" (col. 1, lines 45-66).

Here, Makram-Ebeid is disclosing a method of merging regions, in which each region and contour is created at, and therefore associated with a certain scale parameter. The motivation for using this method is that it "eliminates the largest possible number of interfaces to merge adjacent regions whose intensities are practically identical" (col. 1, lines 37-45). It would have been obvious to one skilled in the art to modify Catros to include a scale parameter to merge similar adjacent regions to aid in correctly identifying contours.

Claim 20 further recites "selecting an optimal scale parameter from said plurality of scale parameters by determining a scale parameter from said plurality of scale parameters that minimizes variance between regions defined by its respective contours". The disclosure by Makram-Ebeid above describes incrementing of a scale

parameter until an optimum level is reached. It also describes an Energy function that includes a variance term, which is minimized based on the scale parameter.

32. Claim 21 recites "The method of claim 20 wherein said method further comprising: encoding a boundary object utilizing said two vertices and said optimal scale parameter". Catros discloses bridging "between each of the facing ends of the disjointed contour elements" (col. 1, lines 40-54). This bridging forms a new contour between two points, which reads on "encoding a boundary object utilizing two vertices", as recited by claim 21. Catros does not disclose an optimal scale parameter. Makram-Ebeid discloses an optimal scale parameter, as described in the rejection of claim 20. It would have been obvious to modify Catros to utilize an optimal scale parameter to encode a boundary object in order to merge similar adjacent regions to aid in correctly identifying contours.

33. Claim 22 recites "The method of claim 20 wherein said detecting further comprising: incrementally detecting a contour of said plurality of contours by utilizing a threshold value, wherein said shortest path is determined by a graph searching process that limits searching of paths to distances less than said threshold value". Catros discloses "if the coding cost of the shortest path is less than a given threshold, this path is considered as the corresponding to the desired bridging, if not, there is no bridging possible between the two points" (col. 2, lines 59-63). The bridging disclosed by Catros reads on the contour detection recited in claim 22.

34. Claim 23 recites "The method of claim 20 wherein said detecting a plurality of contours is operable to only select contours within a rectangular area defined by a width

parameter and said two vertices". Catros discloses "The search space in the image memory is defined in the way shown in FIG. 1, where there is inserted between two points A and B, marking the ends of a discontinuity in a contour C of the image, a square of side D equal to the distance separating the two points A and B and oriented in the plane so that points A and B are disposed on two opposite sides of the square in the middle thereof" (col. 2, lines 63-68; col. 3, lines 1-2). Also see Figure 1 of Catros for further disclosure of this square. Since a square is a type of rectangle, this square reads on the rectangle in claim 23. The "width parameter" in this disclosure is set to the length of side D.

35. As to claim 31, Catros in view of Makram-Ebeid discloses the method of claim 20. Catros further discloses a method wherein detected contours approximate respective edges of the boundary information (col. 1, lines 22-29; the invention approximates edges in areas it is not clear where the edges are).

36. As to claim 32, Catros in view of Makram-Ebeid discloses the method of claim 31. Catros further discloses a method wherein the edges of the boundary information exist before detecting (col. 2, lines 42-48; the invention uses existing data about gradients to detect contours).

37. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Catros in view of Makram-Ebeid as applied to claims 20-23 above, and further in view of Luo.

Claim 24 recites "The method of claim 23 wherein said width parameter and said two vertices are selected by a user interface". Catros in view of Makram-Ebeid obviates the method of claim 23 above. Neither Catros nor Makram-Ebeid disclose a user

Art Unit: 2676

interface for selecting width parameters and two vertices. Luo discloses "In practice, both the width and height of the global search stripe can be determined by the user in an interactive way, according to the motion of video object" (page 8, lines 1-8). See Figure 4 of Luo for an example of how the width and height can be limited. Luo further discloses "In our system, the user defines a video object by specifying its contour on multiple anchor frames" (page 2, lines 3-19).

The height of the local search stripe disclosed by Luo reads on the width parameter of claim 24. The contour specified by the user in Luo reads on the two vertices of claim 24, because a number of vertices define a contour. Luo discloses that "fully automatic segmentation is difficult" (page 1, lines 27-29), giving the motivation for including a user interface. It would have been obvious to one skilled in the art to modify Catros and Makram-Ebeid to include a user interface in order to simplify the task of segmentation as taught by Luo.

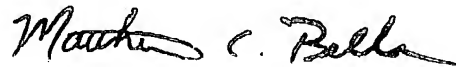
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron M Richer whose telephone number is (703) 305-5825. The examiner can normally be reached on weekdays from 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (703) 308-6829. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AMR  
12/21/04



MATTHEW C. BELLA  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600